

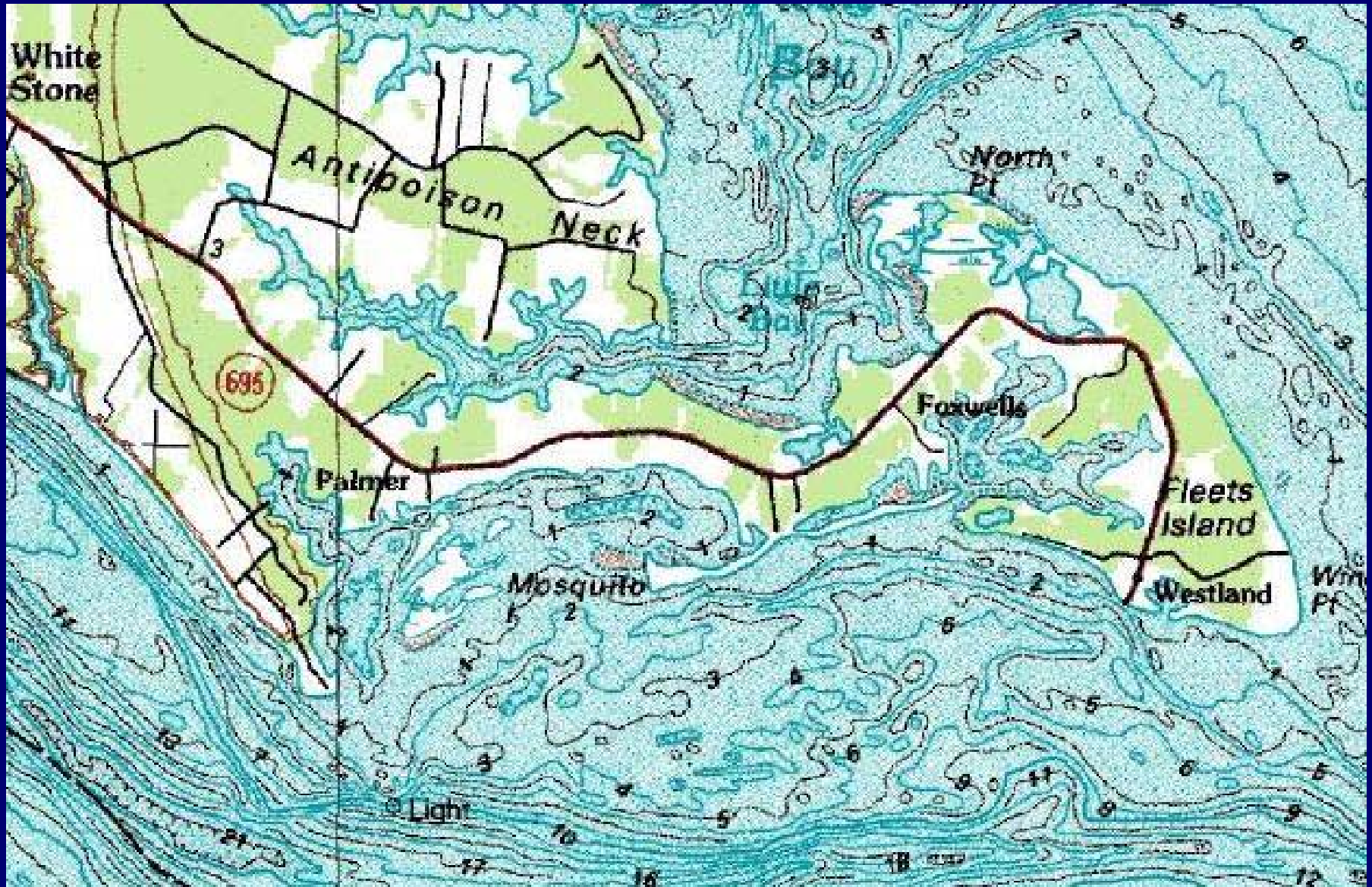
Bacteria TMDL Development for Shellfish Waters in Oyster & Mosquito Creeks

Final Public Meetings

January 8, 2009
Kilmarnock, VA



Mosquito & Oyster Creeks Map



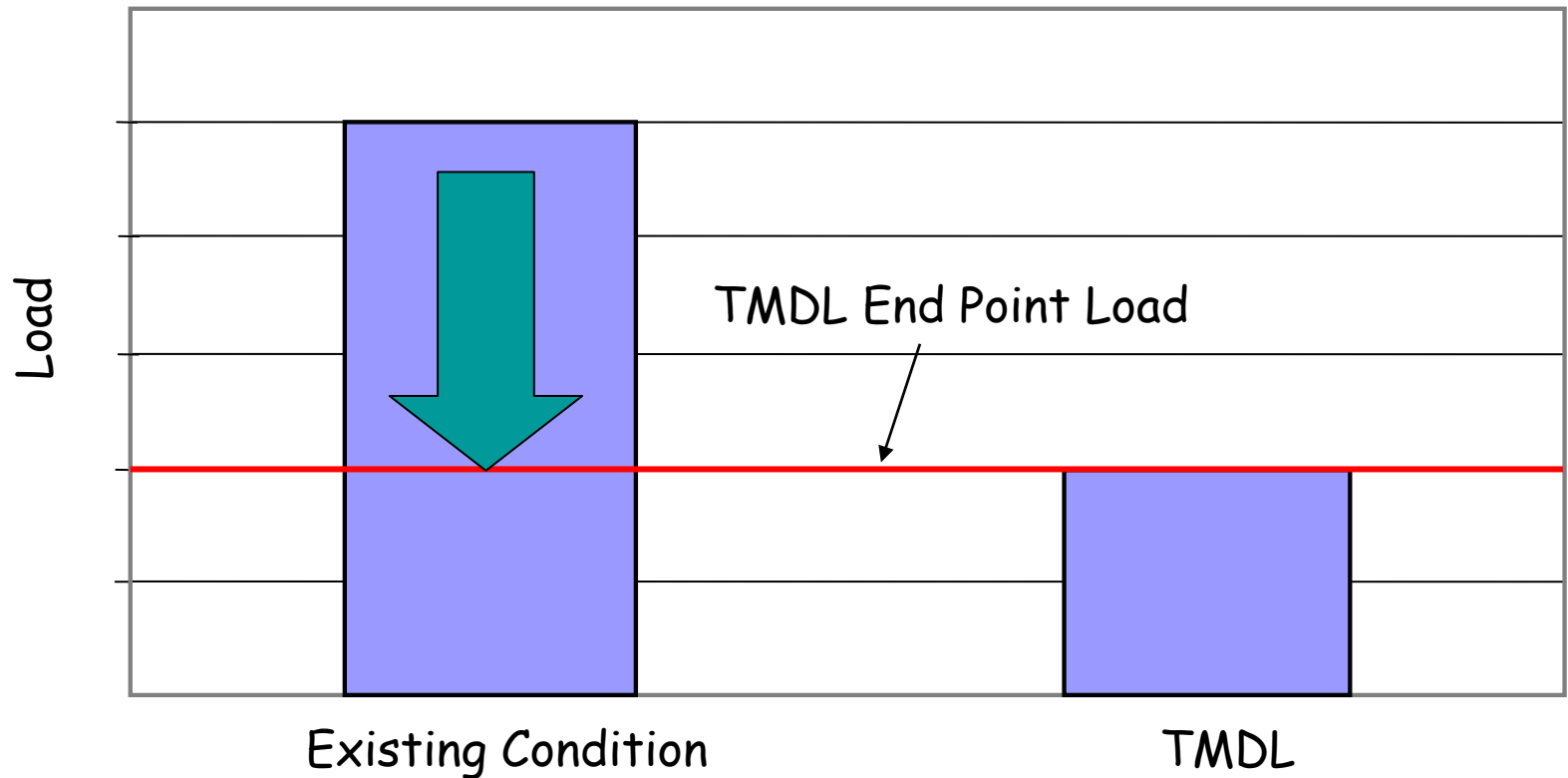
What is a TMDL?

TMDL = Total Maximum Daily Load =
maximum amount of a pollutant that
can enter a waterbody without violating
water quality standards (WQS)



WQS = numeric or narrative limits on
pollutants that ensure the protection of
human health and of aquatic life

An Example TMDL



Reducing existing bacteria load to the TMDL end point load is expected to restore water quality.

Why are TMDL studies necessary?

- TMDLs must be developed for water bodies that do not meet water quality standards (impaired waters).
- Impaired waters occur throughout Virginia in lakes, streams, and tidal waters.
- In Virginia, TMDLs for 210± impaired waters must be developed by 2010.
 - Of these, 25± are shellfish TMDLs under a consent order.

People involved in the Process:

- Virginia Department of Health - Division of Shellfish Sanitation
- Virginia Department of Conservation and Recreation
- Virginia Department of Environmental Quality
- Other State Agencies, Local Governments and Planning Districts
- U.S. Environmental Protection Agency and other appropriate federal agencies
- Citizens groups, educational institutions environmental groups, & local business
- **YOU!**



What information is used to develop a TMDL?

- VDH Sanitary Shoreline Survey
- VDH Bacteria monitoring data
- Population estimates for humans, pets, wildlife, livestock (Census, VIMS, DCR, DGIF, & the public)
- Affected waters volume
- Bacterial Source Tracking Data (BST)
- Land Use, Climate, Tide, etc.
- DEQ permit data
- DEQ spill response and remediation data

Virginia's TMDL Development Process

– TMDL Development

- Find sources & determine reductions
- Four meetings & two public comment periods

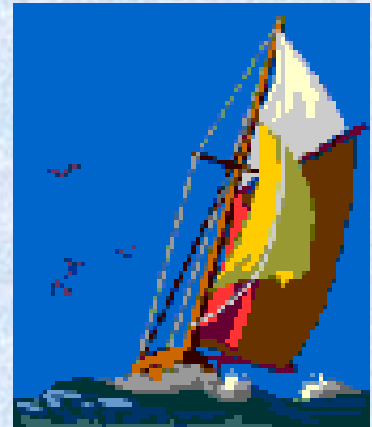
– Implementation Plan Development

- Identify conservation measures to fix the problem. Conservation measures are often called Best Management Practices or BMPs
- Multiple meetings with stakeholders & citizens

– Implementation

- Install BMPs and sample for improvement.

****Many opportunities for public input and participation!****



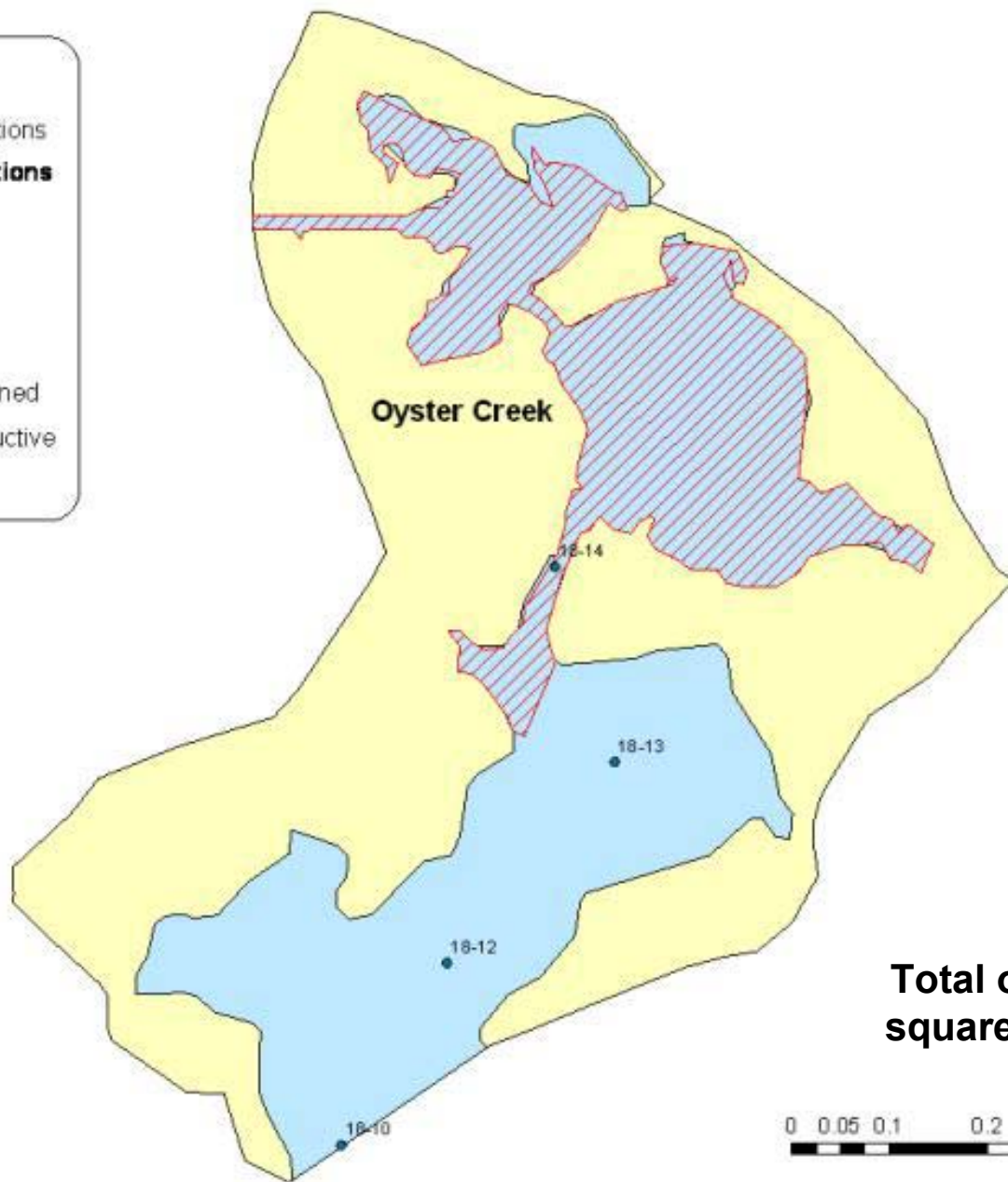
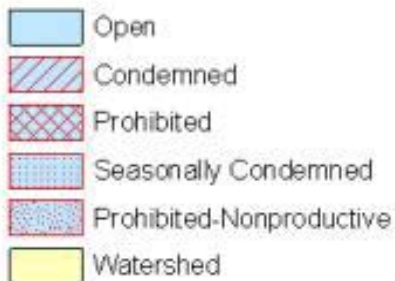
Why is a TMDL needed for the Oyster & Mosquito Creeks Watersheds?

- VDH Division of Shellfish Sanitation (DSS) monitors fecal coliform levels in shellfish waters
- Applicable water quality standards
 - 30-month geometric mean not exceeding 14 MPN/100 mL
 - and a 90th percentile not exceeding 49 MPN/100 mL
- The portions of Oyster & Mosquito Creeks that currently fail these standards are:

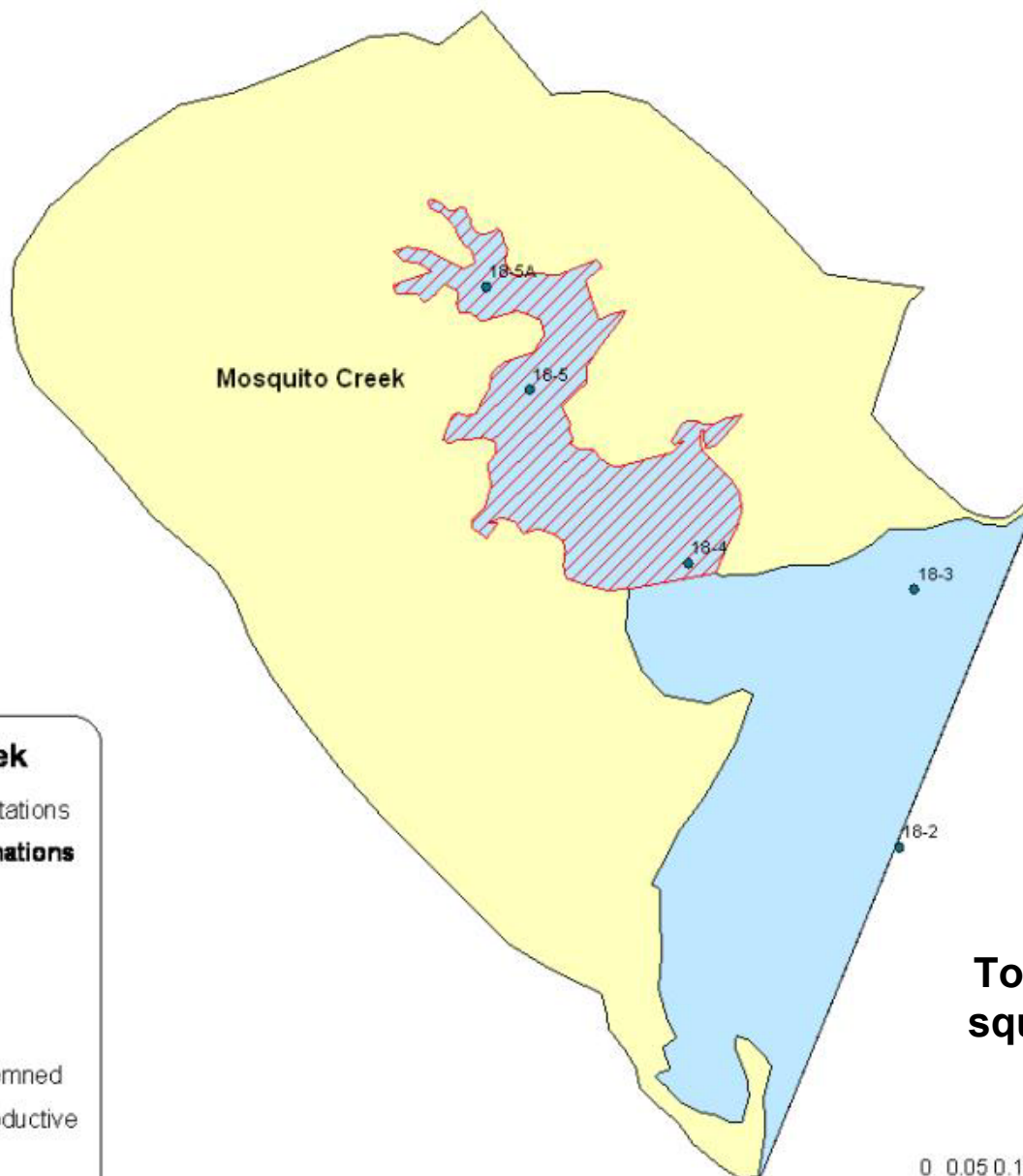
Oyster Creek

• VDH Monitoring Stations

VDH Shellfish Condemnations







Total of 0.63
square miles



Mosquito Creek

• VDH Monitoring Stations

VDH Shellfish Condemnations

-  Open
-  Condemned
-  Prohibited
-  Seasonally Condemned
-  Prohibited-Nonproductive
-  Watershed

**Total of 0.91
square miles**

0 0.05 0.1 0.2 0.3 0.4 Miles

Water Quality Data Summary for Oyster & Mosquito Creeks - Growing Area 18

90th Percentile represents the more stringent reduction

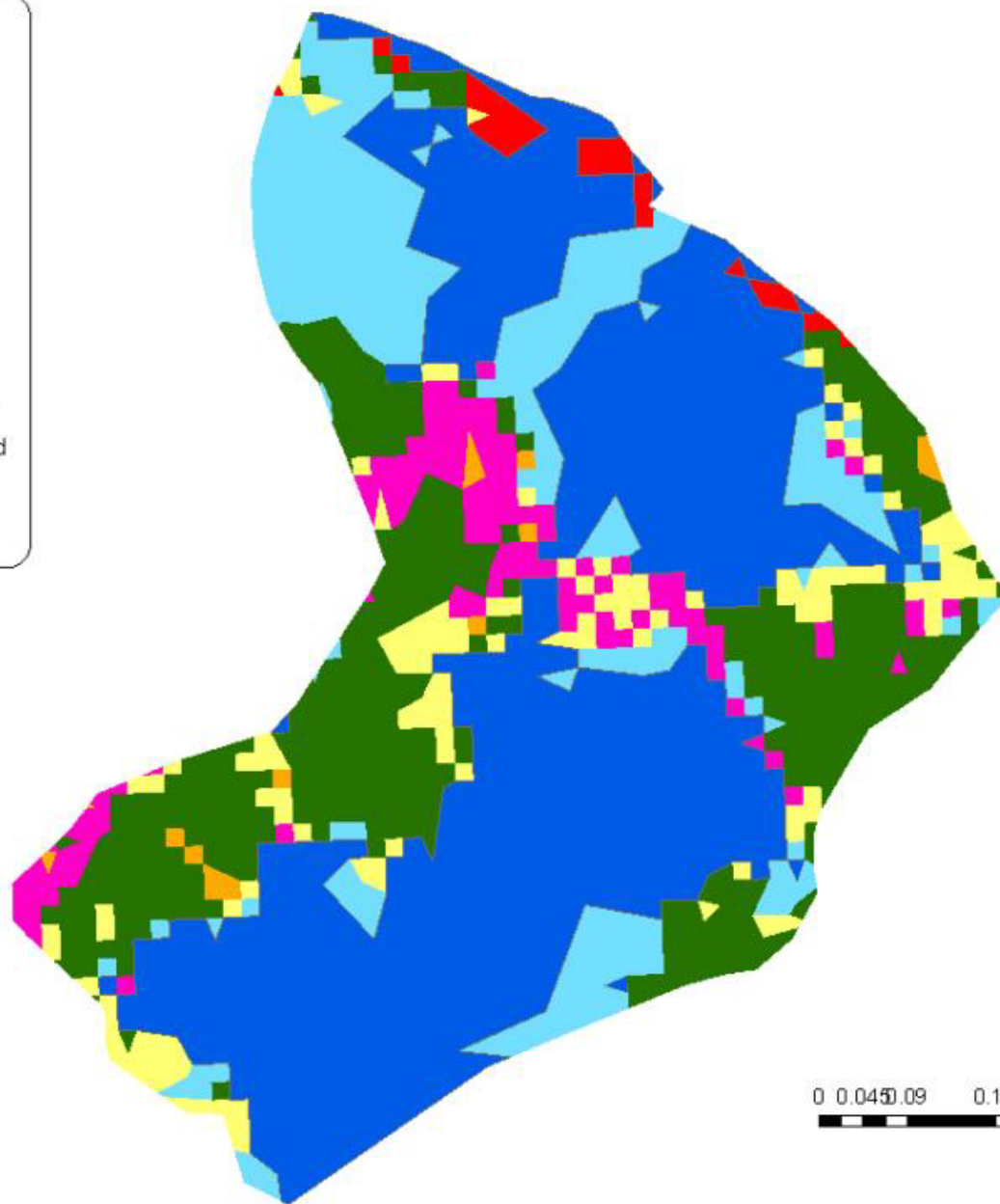
Station	Condemnation Area	Total Observations (one/Month)	Geometric Mean	Station Violates Geometric Standard: 14 MPN	90th Percentile	Station Violates 90th Percentile: 49 MPN
Mosquito Creek						
18-5A	203	110	18.58	Yes	173.91	Yes
18-5	203	260	16.53	Yes	93.97	Yes
18-4	203	259	11.33	No	80.36	Yes
Oyster Creek						
18-14	186/053	219	11.78	No	85.26	Yes

Oyster Creek

Landuse

VA NLCD

- Unclassified
- Open Water
- Urban
- Barren or Mining
- Transitional
- Forest
- Agriculture - Pasture
- Agriculture - Cropland
- Other Grasses
- Wetlands



0 0.045 0.09 0.18 0.27 0.36 Miles

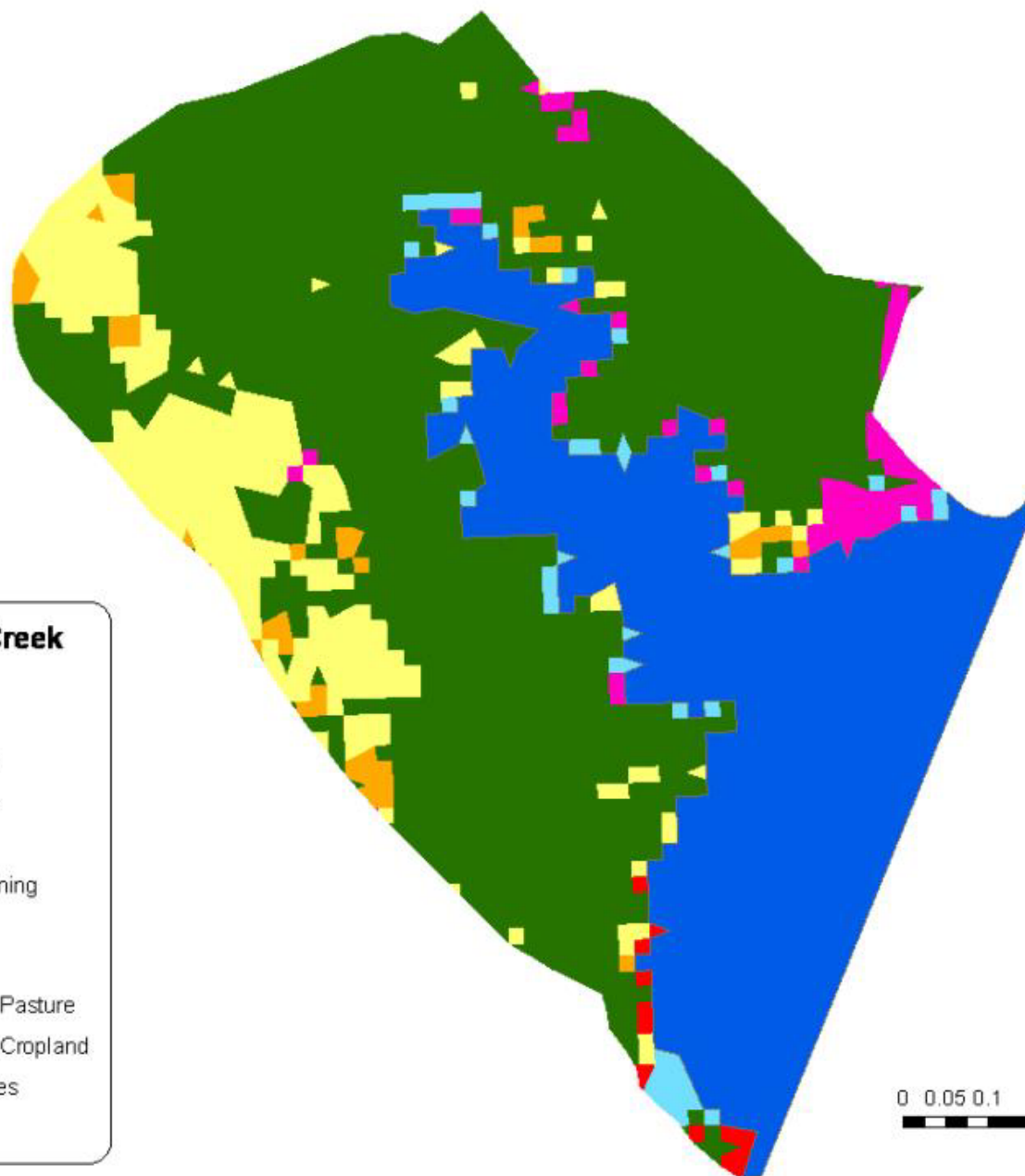


Mosquito Creek

Landuse

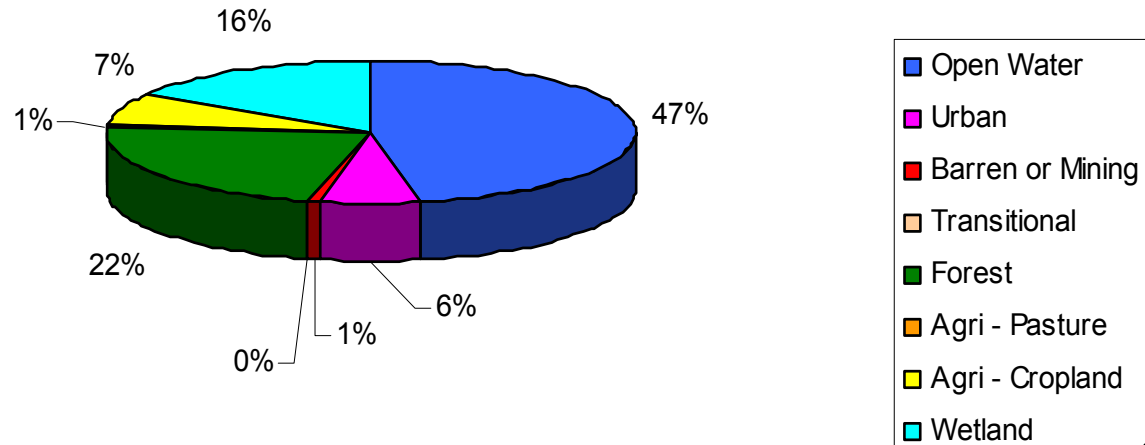
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-  Unclassified
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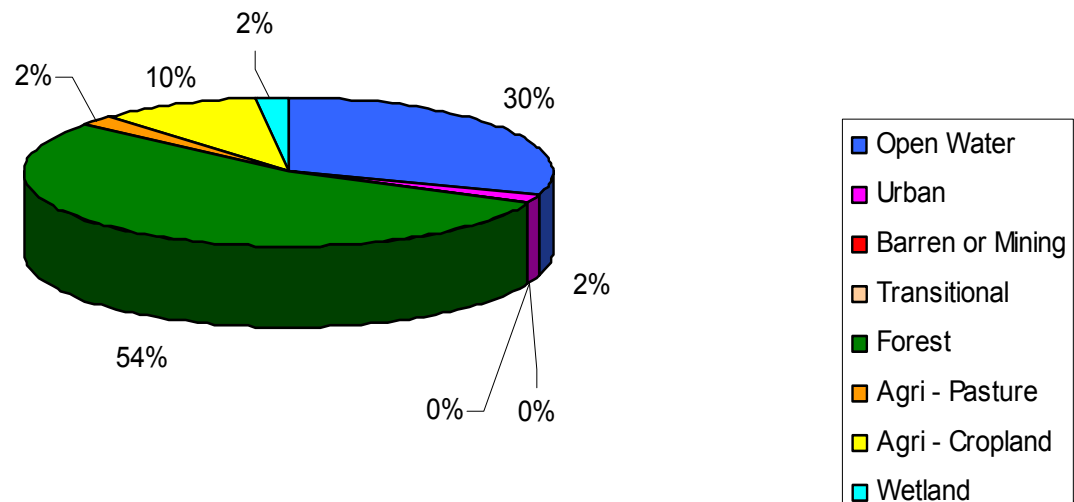


0 0.05 0.1 0.2 0.3 0.4 Miles

Oyster Creek Land Use Percentages by Type



Mosquito Creek Land Use Percentages by Type





Legend

Seawater Sampling Stations

- ▲ Active
- Inactive

Shoreline Survey Deficiencies

- ★ Sewage Treatment Facility - Direct
- ★ Sewage Treatment Facility - Indirect
- Continuous Pollution - Direct
- Continuous Pollution - Indirect
- ▲ Continuous Pollution (Kitchen or Laundry wastes) - Direct
- ▲ Continuous Pollution (Kitchen or Laundry wastes) - Indirect
- Air Pollution - Direct
- Air Pollution - Indirect
- Potential Pollution
- Industrial Wastes - Direct
- Industrial Wastes - Indirect
- Dairy Waste Dumpsite - Direct
- Dairy Waste Dumpsite - Indirect
- Boating Activity
- ▲ Continuous Animal Pollution - Direct
- ▲ Continuous Animal Pollution - Indirect

The survey identified **1 direct** and **3 indirect** onsite sewage deficiencies, 2 indirect contributions of laundry/kitchen waste, 1 direct animal source, 1 marina, 3 boating activity sites, and 3 sites of potential pollution (Sept 2002).

Livestock and Wildlife Population Estimates for Collective Watersheds

	Cattle	Chickens	Horses	Dogs	Deer	Raccoons	Ducks	Geese
Oyster Creek	1	0	0	34	29	81	422	315
Mosquito Creek	7	2	0	66	60	105	501	373
Total for Collective Watershed	8	2	0	99	89	186	924	688
(Data from VIMS)								

Domestic Animals and Septic Systems Observed Contributing Pollution for Oyster and Mosquito Creeks (From 2003 VDH Sanitary Survey and DEQ Observations)
The Human sources are “Potential” sources.

Fecal Coliform Sources	Oyster & Mosquito Creek
Horses	3
Goat	1
Septic (human)	3

Tidal Volumetric Model + BST TMDL Approach

- Calculate volume of impaired water
- Calculate the acceptable loading;

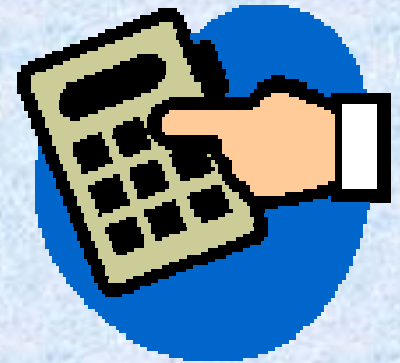
Water Quality Standard (WQS) x Volume

- Calculate actual loading;

Critical fecal count x Volume

- Source determination;

Fecal samples collected for BST are subjected to Antibiotic Resistance Analysis (ARA) and compared with known fecal samples



Use of Bacterial Source Tracking in TMDLs

- VDH-DSS monitoring data is used to calculate critical fecal count
- Supplementary BST samples at selected stations are used to help identify bacteria sources
- Antibiotic Resistance Analysis - BST method for source load allocation into 4 categories:

1. Human
2. Pets
3. Livestock
4. Wildlife





Legend

Seawater Sampling Stations

- ▲ Active
- Inactive

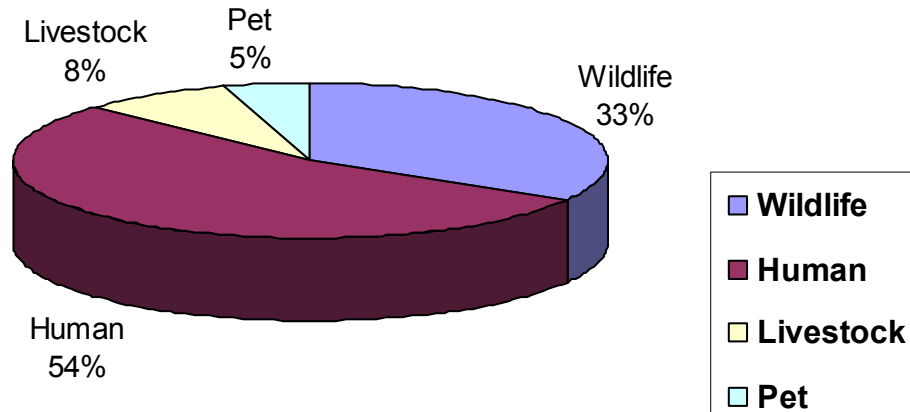
Shoreline Survey Disturbances

- ▲ Sewage Treatment Facility - Direct
- ▲ Sewage Treatment Facility - Indirect
- Continuous Pollution - Direct
- Continuous Pollution - Indirect
- ▲ Continuous Pollution (fisheries or laundry wastes) - Direct
- ▲ Continuous Pollution (fisheries or laundry wastes) - Indirect
- Air Facilities - Direct
- Air Facilities - Indirect
- Potential Pollution
- Industrial Wastes - Direct
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- Dairy Waste Dumpsite - Direct
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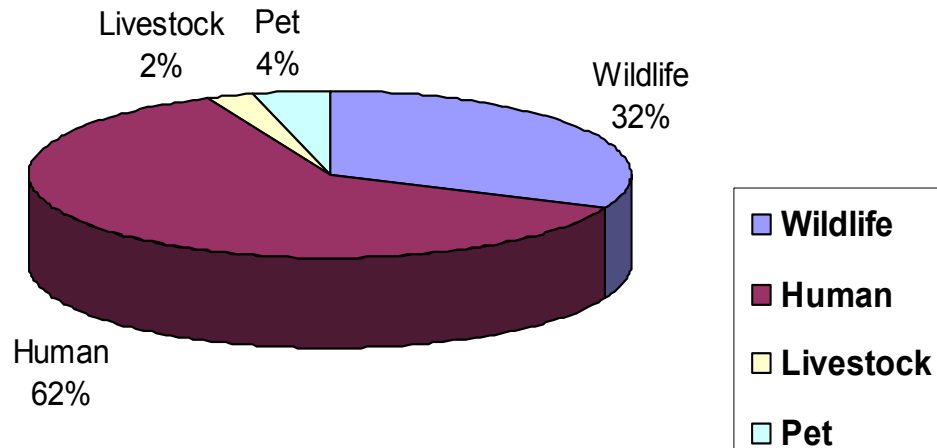
**BST Stations Include #18-5A in Mosquito
Creek and #18-14 in Oyster Creek**

Oyster & Mosquito Creeks BST Results

Oyster Creek BST Percentages
(Isolate, Concentration, and Volume Weighted)



Mosquito Creek BST Percentages
(Isolate, Concentration, and Volume Weighted)



Oyster and Mosquito Creek Watershed

TMDL Table

Condemnation Area	Volume(m3)	90 th Percentile Fecal Coliform (MPN/100ml)	90 th Percentile W.Q. Standard Fecal	Current Load (MPN/day)	TMDL Allowable Load (MPN/day)	Required Reduction (%)
018-053A Oyster Creek	277719	85.26	49	2.37E+11	1.36E+11	42%
018-203A Mosquito Creek	190210	173.91	49	3.31E+11	9.32E+10	72%

Oyster and Mosquito Load Allocations

Condemnation Area	Fecal Type	BST Allocation % of Total Load	Current Load MPN/ day	Load Allocation MPN/ day	Reduction Needed
018-053A Oyster Creek	Wildlife	33%	7.82 E+10	7.82 E+10	0%
	Human	54%	1.28 E+11	2.70 E+10	79%
	Livestock	8%	1.90 E+10	1.90 E+10	0%
	Pets	5%	1.18 E+10	1.18 E+10	0%
	Total	100%	2.37E+11	1.36E+11	42.5%
018-203A Mosquito Creek	Wildlife	32%	1.06 E+11	9.32 E+10	12%
	Human	62%	2.05 E+11	0.00 E+00	100%
	Livestock	2%	6.62 E+9	0.00 E+00	100%
	Pets	4%	1.32 E+10	0.00 E+00	100%
	Total	100%	3.31+11	9.32E+10	71.8%

Next Steps...

- **30 Day Public Comment Period**
Ends February 9th, 2009

Comments should include name, address, and telephone number. All comments will receive a written response and will be incorporated into the final report that will be sent to EPA.

- **Report Submitted to EPA for approval**
- **Implementation Planning**

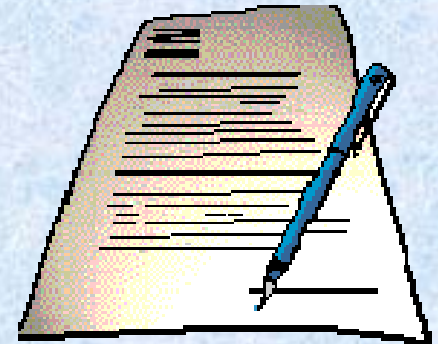
Please Send Comments To:

**Address: DEQ - Piedmont Regional Office
Attn: Margaret Smigo
4949-A Cox Road
Glen Allen, VA 23060**

Email: mjsmigo@deq.virginia.gov

Fax: (804)527-5106

Telephone: (804)527-5124



Report available at:

<https://www.deq.virginia.gov/TMDLDataSearch/DraftReports.jsp>

Presentations available at:

<http://www.deq.virginia.gov/tmdl/mtgppt.html>



Questions?? Comments??

TMDL Website: <http://www.deq.virginia.gov/tmdl>



Appendix C of Draft Report: Table C.1 Observed Geometric Mean and 90th Percentile By Condemned Area and Station

Condemned Area	DSS Station Number	Mean of Geometric Means	SD Geometric Means	Mean of the 90 th Means	SD 90 th Means	Last 30 Sample Geo mean	Last 30 Sample 90 th
018-053 Oyster Creek	18-14	7.06	2.75	35.29	22.22	7.3	37.25
018-203 Mosquito Creek	18-5A	13.96	2.24	95.21	30.59	10.41	70.25
	18-5	9.29	2.47	47.81	17.45	8.2	49.78
	18-4	5.95	1.56	26.98	16.16	4.21	18.65